DOCUMENT RESUME

ED 134 937 CS 003 192

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TITLE Strategic Processes in Beginning Reading. Technical Report No. 15.
INSTITUTION Bolt, Beranek and Newman, Inc., Cambridge, Mass.; Illincis Univ., Urbana. Center for the Study of Reading.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Nov 76
CONTRACT 400-76-0116
NOTE 19p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Beginning Reading; *Cognitive Development; Elementary Education; *Reading Processes; *Reading Research; *Reading Skills; Remedial Reading; Theories
IDENTIFIERS *Center for the Study of Reading (Illinois)

ABSTRACT

A strategic process perspective is used to integrate reading research with developmental findings in cognitive psychology. The main concepts of the system are explicated and are used to reinterpret a variety of previous studies. Analysis of strategic demands and the factors affecting strategic behavior yield a framework for conceptualizing the development of reading fluency. Implications of this approach are suggested for beginning instruction, remediation procedures, and subskills analysis of reading processes. (Author/AA)

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CENTER FOR THE STUDY OF READING*

Technical Report No. 15

STRATEGIC PROCESSES IN BEGINNING READING

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November 1976

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CS 003 192

The research reported herein was supported in part by the National Institute of Education under Contract No. MS-NIE-C-400-76-0116.

*Designation as a Center pending approval.

Abstract

A presentation is given of a strategic-process perspective on the development of reading skills. The approach integrates reading research with developmental findings in cognitive psychology. An explictation of the main concepts of the system is provided along with re-interpretation of a variety of reading research. Analysis of strategic demands and the factors effecting strategic behavior yield a framework for conceptualizing the development of reading fluency. Implications of this approach are suggested for the sub-skills analysis of reading processes, remediation procedures and beginning instruction.

Strategic Processes in Beginning Reading

A major assumption of both beginning instruction and psychological research on early reading in the existence of a cumulative facilitative effect of instruction and learning. This assumption has led to considerable attention directed at identifying sub-skills within the reading process. The persistence and force of this orientation is derived from the fact that for the majority of children--those making progress toward reading proficiency--the stance in valid. Guthrie (1974), however, demonstrates that this is not the case for children experiencing reading difficulties. This latter group fails to demonstrate the high intercorrelation of various phonics skills which characterize good readers. Disabled readers had a high degree of skill in a few basic areas with a sharp drop in performance occurring at some point in each profile. This lack of interfacilitation among sub-skills resulted in almost identical group profiles for the disabled readers and younger normal subjects, but individual patterns were quite different.

The reported failure of disabled readers to utilize a variety of potential information sources in various instructional and experimental situations is characteristic of the literature. The prevalence of this phenomenon suggests the existance of a general-cognitive factor mediating transfer between sub-skills. That groups can be identified as experiencing specific difficulties at certain levels may be useful in directing remediation efforts (Cromer, 1970; Levin, 1973) but obfuscate a basic homogeneity of etiology. Processes contributing to fluent reading cannot be conceived as independent of more general aspects of cognitive development. The relationship among sub-skills should, therefore,

be evaluated in terms of an integrative perspective which encompasses developmental factors operating across tasks.

The following three sections elaborate the implications of this approach by: 1) illustrating the perspective applied to research on processes in reading comprehension; 2) explication of cognitive research related to the development of skilled reading; and finally 3) relating the perspective to a variety of research in the early reading period (grades 1 to 6).

Processes in Reading Comprehension - An Illustration

Until recently, the complexity of comprehension both as a psychological process and an instructional goal has resulted in its ostracism from research and instruction in the early reading period. What remains is a mammoth array of didactic techniques and psychological investigations directed at component skills contributing to an end goal of word recognition. Within this framework, comprehension is considered a well-formed aspect of the child's oral-aural language system, with increased efficiency of word recognition skills allowing the child to utilize this capacity (Gates, 1947).

About ten years ago, the attention of linguists to problems of reading instruction created a shift in emphasis from word identification skills to language organization as a principle factor underlying comprehension. Cromer and his associates (Cromer, 1970; Oakan, Weiner, & Cromer, 1971; and Steiner, Weiner, & Cromer, 1971) conducted a series of investigations designed to separate word identification from organizational aspects of comprehension (i.e. word-by-word rather than meaning unit organization).

Working with 5th grade, good and poor readers, Oaken et. al.(1971) measured their comprehension of stories under five conditions. Organization was varied independent of decoding by having subjects listen to tape recordings of stories, two recorded by poor readers and two by good readers. In each case the experimenter orally corrected errors at the time of recording. These two conditions differed in factors such as rate of presentation, amount of erroneous information, interruptions, and corrections.

The remaining three visual-presentation-conditions were: 1) a normal text version of the stories; 2) a typed transcript of poor readers' oral rendition of the stories--including false starts, pauses, mispronunciations and omissions; and 3) a normal text version with prior "identification training" on the story vocabulary. While both the good and poor readers were tested under condition 1, only good readers received condition 2 (which was considered "impaired visual input") and only poor readers received the "identification training" comprising condition 3 (viewed as "improved visual input"). The "identification training" consisted of associating the correct oral response with a flash card presentation of words from the story for that trial.

The exact locus of effect for these last two conditions is unclear. The "impaired visual input" seems to be more a manipulation of semantic and syntactic organization than visual decoding characteristics. The superficial similarity between the format in this condition and poor readers' normal production doesn't justify equating these as levels of a factorial design. Further, the "identification training" employed in condition 3 is one of a number of possible vocabulary instruction techniques. This method assumes that representations of the necessary semantic

referents exist from the child's oral vocabulary and they are easily accessible through phonological mediation.

Despite these methodological limitations the results are suggestive. First, the authors found no improvement in poor readers' comprehension resulting from the word identification training. In addition, good and poor readers' comprehension was equal in the normal auditory presentation condition. This suggests that poor readers don't suffer from a general comprehension deficit, but rather the difficulty is specific to some encoding aspect operating in the reading task. The failure of the identification training to improve comprehension implies that this is not the crucial factor; instead, this group's deficit might be common to both comprehension and identification processes since, presumably, the groups could be differentiated on either skill.

The nature of this deficit is indicated by the pattern of results across tasks. While the good readers performed best under normal visual input, in the other three conditions they demonstrated approximately equal comprehension, doing slightly better under poor visual and auditory conditions than in the normal listening condition. Oakan et al. point out the importance of linguistic organization mediating performance on these tasks; but the uniqueness of the two impaired presentation formats also reflects the good readers' ability to apply strategic operation to new situations. The poor readers seem deficient in this ability, thus performing best in the normal listening mode and doing equally poor on the three tasks requiring strategic performance--the impaired listening condition and the two visual conditions.

The performance of good readers in the above study is strategic in

the same sense that mnemonic mediation is strategic, the essential element being a "means-to-ends" (Flavell, 1970) subordination of activities. Given the end goal of answering multiple-choice questions, the good reader subordinates word recognition to linguistic organization, which in turn facilitates the desired goal. Poor readers, on the other hand, even when given identification training, seem unable to subordinate word recognition to an effective organizational strategy. Tasks requiring strategic behavior have been shown to reflect developmental differences (Brown, 1975), with younger subjects and certain sub-populations (e.g. retardates) being less efficient. For this reason, strategic ability may be a useful focus for research in both early instruction and remediation. The following section develops the framework for such an approach.

Cognitive Research Related To Early Reading Processes

Elaboration of the processes leading to comprehension in early reading should benefit from consideration of the growing body of literature on the development of memorial skills. Reviews of this area are provided by Flavell (1970), Meacham (1972), and Brown (1975), with three facets particularly relevant to the present perspective: the contribution of specific and general factors to strategic behavior; the phenomenon of "production deficiency"; and the distinction between intentional and incidental forms of memory.

Aspects of Strategic Behavior

Flavell (1970) suggests that strategic development is a function of 1) specific components comprising a mnemonic activity and 2) a general tendency to utilize these activities in situations requiring a strategy. Since an activity "must be within the repertoire of the child before it can be applied to the task of remembering" (Meacham, 1972), it follows

that the child must either construct the component skills for some independent purpose or receive instruction to foster the activity. For example, categorization as an activity develops slowly through continuing interaction of the child with his environment. Once the operation of categorization is established, then this activity can be subordinated to an appropriate memory task and facilitate performance.

The second component is independent of any particular activity (e.g. rehearsal, categorization, elaboration), consisting of an increased "propensity, both in recall tasks and in many others which have a similar means-to-ends structure, to search the repertoire for activities to perform now, the performance of which has no immediate relevance but will facilitate some other activity subsequently" (Flavell, 1970).

While the reading literature abounds with references to sub-skills and skill hierarchies, little attention has been given to this latter aspect of "planfulness" or "executive control." The low intercorrelation of sub-skills obtained by the disabled readers in Guthrie's (1974) study reflects a general strategic deficit which can manifest itself at any of a number of different skill levels.

Production Deficiency

The phenomenon of production deficient behavior is closely related to "planfulness" factor. "Periods of production deficiency . . . refer to the time during which an activity is well formed but not yet subordinated to the goal of remembering" (Meacham, 1972). Gibson, Tenney, and Sharabany (1971) provide an illustration of this effect in a decoding type task. The study required third and fourth grade subjects to solve a set of word-anagrams within a superordinate structure.

The words either combined to form a sentence or represented instances of a category (e.g., fruits). While subjects were able to spontaneously recognize and use categorical structure to facilitate solutions, this effect was not found in the sentence condition. The children failed to recognize the syntactic/semantic relationship in the set of anagrams; additional instructions to read the set of previously solved words before continuing, however, were sufficient to allow subjects to profit from this form of organization. A relatively simple manipulation of executive control (in this case the external establishment of a strategy) had a significant effect on performance. In general, improvement after instruction or simple training is a crucial characteristic of production deficient behavior.

Intentional versus Incidental Memory

A final pertinent distinction is that between deliberate and involuntary remembering. Deliberate memory is characterized by the intentional selection of operations like those described above. It is not, however, the intentional aspect which results in improved memory but processing the material in an appropriate manner. A large part of what we know is not acquired "through deliberate attempts at remembering, but as the involuntary result of our intelligent interaction with a meaningful environment" (Brown, 1975).

Jenkins, Craik, and their associates have shown (Hyde & Jenkins, 1973; Walsh & Jenkins, 1973; Craik & Lockhart, 1972; and Craik & Tulving, 1975) that incidental and intentional learning are equal for adults when the incidental orienting task induces processing semantic aspects of the materials. In either case, Craik and Tulving (1975) conclude that:

> while some structural analysis must precede semantic analysis, a full structural analysis is not usually carried out; only those structural analyses necessary to provide evidence for subsequent domains are performed. Thus in the case where a stimulus is highly predictable at the semantic level, only rather minimal structural analysis, sufficient to confirm expectations, would be carried out.

This last statement not only echoes LaBerge and Samuels' (1974) automaticity notion but incorporates the major elements of Goodman's (1976) and Smith's (1971) reading models.

The intentional behavior of children, in contrast, often fails to invoke semantic elaboration strategies (Murphy and Brown, 1975). This is a particularly troublesome tendency, since so much of initial reading instruction emphasizes structural aspects, such as phonic analysis.

Relationship of Strategic Orientation to Research on Beginning Reading

Weber (1970a & 1970b) presents data on reading errors made by first-grade children which relate to the strategic consideration developed above. Both high- and low-ability groups utilize syntactic-semantic constraints of spoken language in their approach to visual word-recognition. Weber's analysis of substitution indicates that 90% are consistent with the prior grammatical and semantic context. Yet, when the substitution conflicts with the remaining grammatical structure only the high-ability group shows a significant tendency to correct the disparity. All of the children seem able to utilize incidental information resulting from the natural language structure of connected text, but only the more advanced readers actively monitor this information either to construct a coherent theme or verify their decoding efforts.

The increasing importance of graphemic information in these children's word-recognition strategy is documented by both Weber (1970a) and Biemiller (1970). Graphemic similarity of first graders' substitution errors increases over the course of the year. Weber even suggests an inverse relationship between the use of contextual and graphemic constraints in early reading. For high-ability readers this shift toward graphic substitution errors appears to correspond to the development of a more sophisticated decoding operation; however, no such shift is apparent for low-ability children (Biemiller, 1970). For the former group, graphemic analysis becomes an additional aspect of a decoding strategy already subordinate to comprehension. Poor readers probably increase their attention to the orthography as a direct result of instruction at the expense of monitoring context.

The continuing importance of strategic development over the entire elementary period is demonstrated in a study by Klein, Klein and Bertino (1974), using a "Word Boundary" task. This procedure requires subjects to separate words from a uniformly spaced array of letters, either with or without the clue of contextual organization. The task is facilitated by a variety of orthographic information--e.g. knowledge of initial and final cluster, sequential and spatial frequencies, controlling vowel

patterns, etc. The difference in the number of words/minute identified in the random and contextually organized passages is intended by the authors to indicate the usefulness of this factor in word recognition.

The organizational factor accounts for 16% of the variance for 4th graders, while 65% of the variance for 6th graders is attributable to this factor, an effect comparable to adult performance. On the surface, this developmental difference seems incompatible with the contextual constraints demonstrated by beginning readers in Weber's (1970a) study. The "word boundary" task, however, requires continual monitoring of prior context coordinated with the application of word attack skills. The necessity of constructing each word makes the task considerably more difficult than normal reading, where an automatic sight vocabulary can reduce the strategic load. Finally, the uniqueness, accuracy demands and time pressure all contribute to the strategic difficulty of the situation. Thus, the Klein, et al. (1974) study reflects the general strategic advantage of older children in reading related performance, but not necessarily the onset of that behavior.

A similar type of strategic deficit, this time between good and poor sixth-grade readers, is illustrated in a study by Mason (1975). Using a reaction time measure of letter scan performance, consistent differences were found between the groups' ability to utilize spatial redundancy patterns within words. A poor reader's performance deficit could result from either a production deficiency or a competence difference in knowledge of spatial constraints. While Mason doesn't distinguish between these alternatives, the former explanation is partially suggested in the data, since given "intensive training" on the scan test, good readers show improved performance beyond that

attributed to spatial redundancy; poor readers, on the other hand, maintain similar performance characteristics across trials. This consistency represents a failure to adapt to the testing situation. As in the Klein, et al. study, task demands are important in determining an effective strategy: thus, differences in both specific and general elements of strategic behavior can affect performance.

Since an individual's perception of situational demands appears to be an important prerequisite of strategic behavior, establishing these demands should be a key element of beginning reading instruction. The effect of variations in teaching methods has been investigated by Barr (1975a). Children instructed by a sight-word method differ from those receiving phonic instruction in their approach to identifying words in isolation. With few exceptions, children in the former group make no non-word responses and choose over 75% of substitution errors from their previously experienced reading vocabulary. Errors for the phonic group include non-words and a sample of substitutions drawn from their natural language vocabulary. Non-word errors and the limits of substitution sampling represent specific adaptations to task demands as a function of instruction.

The use of an isolated word test in this study restricts the types of information available for word identification; however, within these limits the effect of instructional approach on childrens' strategic behavior is impressive. The task demands implicit in both the initial teaching approach and the materials used (Barr, 1975b) require close attention if the end goal is to foster comprehension rather than just word attack skills.

Two recent studies--Samuels, Dahl and Archwamety (1974) and Levin (1973)--are indicative of the current perspective on strategic training in the reading literature. Samuels, et al. (1974) attempt to facilitate comprehension by training a hierarchy of sub-skills comprising a "Hypothesis/Test" model of word recognition. This model induces context-dependent expectations which are confirmed through minimal clue use--the initial letter of the target word. Two groups, one of mentally retarded children (mean age = 10.3, mean IQ = 73), the other third-grade poor readers (mean IQ = 107), were trained on the skill hierarchy over an extended period of time (14 weeks and 7 months, respectively.)

A modified cloze task comprised both the last phase of training and the dependent measure of comprehension. The experimental subjects supplied more exact replacements in this dependent measure than control subjects. However, this difference cannot be assumed to imply greater comprehension. The original validation of cloze as a measure of comprehension depends on its correlation with other more ecologically valid measures. Since the experimental subjects were trained on the cloze task, transfer to other criterion measures cannot be assumed. This failure to generalize training, especially for retarded subjects who display a number of strategic deficits, has been consistently demonstrated in transfer of training studies (Campione & Brown, 1974).

Levin (1973) provided short-term imagery training to three groups of fourth-grade children. Subjects were classified according to Cromer's (1970) distinctions as: Good readers; deficient readers--poor vocabulary and comprehension test performance; and difference readers--poor comprehension but adequate vocabulary scores. Instructions

to construct a visual image of each sentence as they read yield dramatic improvement on the comprehension measure for the difference group but not the deficit subjects. The former group has the prerequisite skills for adopting the strategy but is normally deficient in the tendency to organize. The deficit readers lack a specific component of the imagery task--that is, the ability to decode the written message. A combination of Samuels' and Levin's approaches might be effective for these subjects.

Viewing research on reading through the strategic-process perspective developed above allows the integration of a number of previously unrelated findings. In addition, this perspective has generated a substantial body of research in the area of memory development (Brown, 1975) and promises to be equally productive when applied to beginning reading. For example, further research is needed to identify components which contribute to spontaneous generation of strategic behavior. If difficulties in this area can be identified in first grade, as Weber's and Biemiller's data tend to indicate, then a combination of training in specific and general aspects of appropriate strategies may foster more normal development toward reading proficiency. Research on task demands in beginning reading, spontaneous strategic approaches to these demands, and general components of strategic orientation are necessary to achieve this goal.

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